

WE CLAIM:

1. An isolated polynucleotide comprising: a) a polynucleotide having the sequence as shown in SEQ ID NO:1, or its complement; or b) a fragment of said polynucleotide wherein said fragment is: i) at least 10 nucleotides in length; and ii) does not correspond identically in its entirety to any portion of the sequence shown in SEQ ID NOs:2 or 3 or any other known polynucleotide; or c) a polynucleotide that selectively hybridizes to the sequence of SEQ ID NO:1, or said fragment, relative to a known polynucleotide.

2. The polynucleotide of claim 1, wherein said polynucleotide that selectively hybridizes to the sequence of SEQ ID NO:1, or said fragment, relative to a known polynucleotide, hybridizes under intermediate stringency conditions.

3. The polynucleotide of claim 1, wherein said polynucleotide that selectively hybridizes to the sequence of SEQ ID NO:1, or said fragment, relative to a known polynucleotide, hybridizes under high stringency conditions.

4. The polynucleotide according to claim 1 wherein said polynucleotide comprises the sequence as shown in SEQ ID NO:1, or its complement, or said fragment thereof.

5. The polynucleotide according to claim 2 wherein said polynucleotide comprises the sequence as shown in SEQ ID NO:1, or its complement, or said fragment thereof.

6. The polynucleotide according to any of claim 3 wherein said polynucleotide comprises the sequence as shown in SEQ ID NO:1, or its complement, or said fragment thereof.

7. The polynucleotide of claim 1, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

8. The polynucleotide of claim 2, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

9. The polynucleotide of claim 3, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

10. The polynucleotide of claim 4, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

11. The polynucleotide of claim 5, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

12. The polynucleotide of claim 6, wherein said polynucleotide consists essentially of the sequence shown in SEQ ID NO:1, or its complement, or a fragment thereof.

13. The polynucleotide of claim 1, wherein said fragment is at least 12 nucleotides in length.

14. The polynucleotide of claim 2, wherein said fragment is at least 12 nucleotides in length.

15. The polynucleotide of claim 3, wherein said fragment is at least 12 nucleotides in length.

16. The polynucleotide of claim 1, wherein said fragment is at least 15 nucleotides in length.

17. The polynucleotide of claim 2, wherein said fragment is at least 15 nucleotides in length.

18. The polynucleotide of claim 3, wherein said fragment is at least 15 nucleotides in length.

19. The polynucleotide of claim 1, wherein said fragment is at least 20 nucleotides in length.

20. The polynucleotide of claim 2, wherein said fragment is at least 20 nucleotides in length.

21. The polynucleotide of claim 3, wherein said fragment is at least 20 nucleotides in length.

22. The polynucleotide of claim 1, wherein said fragment is at least 25 nucleotides in length.

23. The polynucleotide of claim 2, wherein said fragment is at least 25 nucleotides in length.

24. The polynucleotide of claim 3, wherein said fragment is at least 25 nucleotides in length.

25. The polynucleotide of claim 1, wherein said fragment is at least 30 nucleotides in length.

26. The polynucleotide of claim 2, wherein said fragment is at least 30 nucleotides in length.

27. The polynucleotide of claim 3, wherein said fragment is at least 30 nucleotides in length.

28. The polynucleotide of claim 1, wherein said fragment is at least 35 nucleotides in length.

29. The polynucleotide of claim 2, wherein said fragment is at least 35 nucleotides in length.

30. The polynucleotide of claim 3, wherein said fragment is at least 35 nucleotides in length.

31. The polynucleotide of claim 1, wherein said fragment is at least 40 nucleotides in length.

32. The polynucleotide of claim 2, wherein said fragment is at least 40 nucleotides in length.

33. The polynucleotide of claim 3, wherein said fragment is at least 40 nucleotides in length.

34. The polynucleotide of claim 1, wherein said fragment is at least 45 nucleotides in length.

35. The polynucleotide of claim 2, wherein said fragment is at least 45 nucleotides in length.

36. The polynucleotide of claim 3, wherein said fragment is at least 45 nucleotides in length.

37. The polynucleotide of claim 1, wherein said fragment is at least 50 nucleotides in length.

38. The polynucleotide of claim 2, wherein said fragment is at least 50 nucleotides in length.

39. The polynucleotide of claim 3, wherein said fragment is at least 50 nucleotides in length.

40. The polynucleotide according to claim 1, wherein said polynucleotide, or its complement or said fragment further comprises a detectable label.

41. The polynucleotide according to claim 1, wherein said polynucleotide, or its complement or said fragment is attached to a solid support.

42. A host cell comprising the isolated polynucleotide of claim 1.

43. An isolated polypeptide encoded by the polynucleotide of claim 1.

44. An isolated polynucleotide comprising a sequence encoding the polypeptide of claim 43.

45. The isolated polynucleotide of claim 44, wherein said polynucleotide is at least 3000 nucleotides.

46. An isolated polynucleotide comprising a sequence contained in SEQ ID NO:1 and a sequence contained in SEQ ID NO:2.

47. The polynucleotide of claim 46, further comprising a sequence contained in SEQ ID NO:3.

48. An isolated polynucleotide comprising a sequence contained in SEQ ID NO:1 and a sequence contained in SEQ ID NO:3.

49. An isolated polynucleotide comprising a sequence encoding nacrein of *Pinctada margaritifera*.

50. The isolated polynucleotide of claim 49, wherein said polynucleotide is between 1000 and 6000 nucleotides in length.

51. The isolated polynucleotide of claim 50, wherein said polynucleotide is between 1000 and 2000 nucleotides in length.

52. The isolated polynucleotide of claim 49, wherein said sequence is contained in SEQ ID NO:1.

53. A method of determining a condition that permits pearl formation, said method comprising:

- a) cultivating a pearl oyster under a condition of interest; and
  - b) detecting expression of *nacre* gene of the oyster by contacting a sample from the oyster with the polynucleotide of claim 1;
- whereby detection of said expression indicates that said condition of interest permits pearl formation.

54. The method of claim 53, wherein said pearl oyster is of the species *Pinctada margaritifera*.

55. The method of claim 53, wherein said sample from the oyster comprises RNA.

56. The method of claim 55, wherein said sample is from mantle tissue.

57. An isolated antibody or antigen binding fragment thereof, that binds to the polypeptide of claim 43, or fragment thereof.

58. An isolated antibody that binds to the polypeptide of claim 43, or fragment thereof, said antibody made by the method comprising:

- (a) immunizing a host animal with a composition comprising said polypeptide, or fragment thereof; and
- (b) collecting cells from said host expressing antibodies against the polypeptide, or fragment thereof.

59. An isolated antibody that binds to the polypeptide of claim 43, or fragment thereof, said antibody made by the method comprising:

- (a) providing a cell line producing an antibody, wherein said antibody binds to said polypeptide, or fragment thereof; and
- (b) culturing said cell line under conditions wherein said antibodies are produced.

60. A method of determining a condition that permits pearl formation, said method comprising:

- a) cultivating a pearl oyster under a condition of interest; and
- b) detecting expression of *nacre* gene of the oyster by contacting a sample from the oyster with the antibody of claim 57;

whereby detection of said expression indicates that said condition of interest permits pearl formation.

61. A method of determining a condition that permits pearl formation, said method comprising:

- a) cultivating a pearl oyster under a condition of interest; and
- b) detecting expression of *nacre* gene of the oyster by contacting a sample from the oyster with the antibody of claim 58;



whereby detection of said expression indicates that said condition of interest permits pearl formation.

62. A method of determining a condition that permits pearl formation, said method comprising:

- a) cultivating a pearl oyster under a condition of interest; and
- b) detecting expression of *nacre* gene of the oyster by contacting a sample from the oyster with the antibody of claim 59;

whereby detection of said expression indicates that said condition of interest permits pearl formation.

63. The method of claim 60, wherein said pearl oyster is of the species *Pinctada margaritifera*.

64. The method of claim 60, wherein said sample from the oyster comprises polypeptides.

65. The method of claim 64, wherein said sample is from mantle tissue.

66. A method of detecting a nacrein-expressing oyster, said method comprising:

- (a) contacting a sample from said oyster with the polynucleotide of claim 1;
- and
- (b) detecting hybridization of said polynucleotide to the sample.

67. A method of detecting a nacrein-expressing oyster, said method comprising:

- (a) contacting a sample from said oyster with the antibody of claim 57; and

(b) detecting binding of said antibody to the sample.

68. A method of quantifying *nacre* gene expression in a sample, said method comprising:

- (a) contacting said sample with the polynucleotide of claim 1;
- (b) detecting hybridization of said polynucleotide to said sample;
- (c) comparing the amount of the hybridization of step (b) with the amount of hybridization of said polynucleotide to a reference polynucleotide.

69. The method of claim 68, wherein said sample is obtained from a pearl oyster.

70. A method of quantifying nacrein in a sample, said method comprising:

- (a) contacting said sample with the antibody of claim 57;
- (b) detecting binding of said antibody to said sample;
- (c) comparing the amount of the binding of step (b) with the amount of binding of said antibody to a reference polypeptide.

71. The method of claim 70, wherein said sample is obtained from a pearl oyster.

72. An isolated polypeptide according to claim 43, comprising amino acids 81-194 of SEQ ID NO:4.

73. An isolated polypeptide according to claim 43, comprising amino acids 520-609 of SEQ ID NO:4.

74. An isolated polypeptide according to claim 43, comprising amino acids 81-194 and 520-609 of SEQ ID NO:4.

75. An isolated polynucleotide according to claim 44, comprising a sequence encoding amino acids 81-194 of SEQ ID NO:4.

76. An isolated polynucleotide according to claim 44, comprising a sequence encoding amino acids 520-609 of SEQ ID NO:4.

77. An isolated polynucleotide according to claim 44, comprising a sequence encoding amino acids 81-194 and 520-609 of SEQ ID NO:4.